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ABSTRACT

This report summarizes field work at Kero School in Papua New Guinea, one of five community schools participating in the ongoing research and development efforts of the Indigenous Mathematics Project (IMP). The introductory material describes the site, the school setting, and the community setting. Background on the IMP teacher and the size of classes in grades 2, 4, and 6 are noted. The teacher's lack of organizational and planning skills is reported. In the evaluation of instructional materials, teacher's notes, and learning aids, several suggestions for improvement were noted, especially the need for more details in the teacher's notes. It was observed that while the upper two grades used English readily, the teacher often switched to Imbonggu or Pidgin to help pupils in grade 2. Brief comments are given on classroom interaction and the results of student interviews. The combination of dedicated teacher and supportive community were viewed as components of successful schooling at this site. (MNS)

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INDIGENOUS MATHEMATICS PROJECT

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KERO COMMUNITY SCHOOL FIELD REPORT

Karen L. Johnson

Working Paper 9
November 1980

THE INDIGENOUS MATHEMATICS PROJECT

This series of working papers and research reports has been published to provide a comprehensive source of documentation on research and development efforts associated with the Indigenous Mathematics Project. The Project was established in 1977 by the Government of Papua New Guinea to investigate various aspects of traditional mathematics development. During the first phase (1977–79) of the five year program, basic research in crosscultural cognitive development was carried out and indigenous counting, classification and measurement systems used throughout the country were documented. During the second phase of the project (jointly funded by the Department of Education and UNESCO), pilot instructional materials were developed and trialled. The intent was to assess the feasibility of utilizing complementary aspects of indigenous and Western mathematics as a basis for developing culturally relevant student materials, instructional aids and teachers' guides which reflect the practical constraints of the community school environment. The results of IMP work are intended to inform future curriculum development in an effort to provide more appropriate instructional materials and learning aids for Community Schools throughout Papua New Guinea.

Series Editor: Randall Souviney
Managing Editor: Jacquie Wathen

INDIGENOUS MATHEMATICS PROJECT

Field Report

KERO COMMUNITY SCHOOL

14 July - 22 August 1980

by

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This report summarizes field work carried out at one of five community schools in Papua New Guinea participating in the ongoing research and development efforts of the Indigenous Mathematics Project.

KERO COMMUNITY SCHOOL

Kero Community School is located in the Ialibu district of the Southern Highlands Province. Departing from Mt Hagen in a provincial education vehicle we travelled southwards towards Mendi along a graded two-way road. It was sealed in places but was smooth enough to travel quite quickly. It was not without its large ruts, however, blind curves, and one-way bridges at the bottom of steep hills. Later, during my supply trips to Mt Hagen, I was frequently reminded by drivers of how many people died here at "this turn" and "that bridge" in car "bumps". We came upon the Ialibu road junction about 60 kilometres from Mt. Hagen. Following this road for about five kilometres we turned onto the narrow, rocky, little used road leading to Kero village. The road was in poor repair and during the rainy season it became completely unservisable. When this occurred one had to walk into the school by forging the creek, or use a very rough stretch of road which ended up about 7 kilometres south of the Ialibu junction, on the main road.

Environment

Kero School lies near Kero village at an elevation of about 2000 metres, between Mt. Ialibu and Mt. Gilawe, the second largest mountain in Papua New Guinea. The temperature during the time I was there, the months of July and August, ranged from 15 degrees to 20 degrees C during the day, to as low as 5 degrees C at night. During my stay it rained almost every day, though there were relatively dry periods when it only rained lightly in the afternoon. During the weeks of rainy season it rained extremely hard for hours at a time.

Another significant feature of the Ialibu environment was the infertile soil. This fact combined with the weather limited the variety of food that could be grown. The main cultivated food item that people grew successfully was kaukau. Greens were also grown and to a lesser extent beans, corn and sugarcane. Coffee cannot be profitably grown in the current soil and climatic conditions.

Housing and Supplies

During my stay at Kero School I lived with the grade 6 teacher and his younger brother, a grade 4 student. His house was built of milled

lumber with double walls, the inner of plywood and the outer of kuni grass mats, and a corrugated steel roof. There were several louvred glass windows though two were covered with kuni mats. The house consisted of two bedrooms, a bathroom and a main room with a kitchen. There was no indoor plumbing. Rain water drained from the roof and was collected in a tank outside the house. Furnishing included a wood burning stove, sink, table, chairs and three metal frame beds with foam mattresses. We used a kerosene lantern for light. We used a pit toilet which was located in a little kuni hut about 30 m from the house. The other teacher's houses were of similar construction, though two were constructed using only bush materials.

There were several small trade stores in Kero Village which carried a limited number of supplies such as tinned fish, rice, coffee, matches and soda. One or two also carried kerosene. In Ialibu there were several larger trade stores that sold frozen chicken, canned meat, rice, milo, canned milk and other small household items.

The majority of my food stuff was purchased in Mt. Hagen where fresh food items were generally available. I was able to acquire fresh greens and other vegetables locally from the teacher's garden or the local villagers.

Initial Reaction

I was dropped off at Kero by a government transport vehicle, which left immediately afterwards. Venina Kada, IMP Research Assistant, accompanied me and stayed with me for the first three days. I was immediately greeted by the male teachers, who seemed genuinely interested in my arrival and very excited to see Mr. Kada again. None of the women teachers or teacher's wives greeted me. They remained out of sight and seemed to avoid me. The children initially seemed just as curious and unsure about me as I was, at first, about them. They exhibited one of two very contradictory behaviours: they either crowded around me so that I had no room to move, or they ran away and hid their faces as I walked by.

Even with Venina Kada's presence I initially felt a little uneasy, which by the end of the week developed into a mild panic. This was due partially

to the fact that I was missing necessary materials but also I was beginning to feel rather isolated. I also found it hard to get adjusted to the cold and wet weather.

By the end of the week I felt very alone and needed to get to Mt. Hagen to pick up some necessary IMP materials and meet with other IMP people. I was informed by teachers that transport between Ialibu and Mt. Hagen would be very difficult that weekend due to the latest gruesome conflict between people from the Mt. Hagen area and people from the Southern Highlands Province. Without a telephone I could not contact my colleagues in Mt. Hagen. The teachers were very hesitant about my trying to make the trip to Mt. Hagen as they seemed to be quite frightened of the Mt. Hagen people. Finally, after much persuasion, I was able to convince one of the teachers to accompany me to Mt. Hagen. Based on our discussion I felt no assurance that I would reach there safely. I was sure that as the bus crept up one of those hills we would be ambushed by a group of men with spears and axes. Contrary to the group consensus, we did reach Mt. Hagen safely and after settling IMP matters and learning a little about the transportation (PMV) system I was able to go back to Kero feeling much more comfortable with the situation.

After a couple of weeks I began to acclimatize to the weather, living conditions and the people. I soon also became aware of the beautiful and unspoiled country and people surrounding me. Whenever I was feeling distraught or alone I only had to walk out towards Mt. Ialibu and I would be taken in by its magnificence and feel at peace.

School Setting

The school property encompassed about 8000 square metres of land including classrooms, assembly area, a sports field, teachers houses and a fish pond. On the west end of the property three classroom buildings were arranged in a C-shape, forming a 30 m by 40 m assembly area in the middle. A kuni structure which housed the garamut was located in this area along with the flag pole which stood in the middle.

Three classroom buildings were built at different times in the 1970's. They are made of milled lumber frames with walls made of woven

pitpit mats and a corrugated iron roof. A row of plastic windows runs along each side wall. The buildings house seven classrooms, a storeroom and an office.

One double classroom without windows made of bush materials was in use as well. A new bush material classroom was being constructed to make room for the intake of two new first grades next year. There was a large playground between the classrooms and the teachers' houses located on the other end of the school property.

History of Schooling at Kero

Kero Community School opened in February 1966, with one teacher and one classroom constructed out of local materials. Before this time there was no schooling available for children in the area, though possibly a few children may have gone to school in Ialibu or outside the area. Kero has been a government school from the time it opened and was never affiliated with a religious denomination. The parents in the community built the first classrooms, and later the Council, in co-operation with the government, built the first permanent classrooms. The school has grown from one teacher and one classroom to eight teachers and eight classrooms over the last fourteen years.

Curriculum Materials and Supplies

Each teacher seemed to have the syllabus for each curriculum area for the appropriate grade level. Also a classroom set of readers and written English texts were available for each class. A small school library housed in the staff room containing ten to twenty books per grade level were available for the teachers to use in their classrooms. I noticed that there was a large science kit in the "science room", but it did not get much use while I was there.

Though some books and supplies were present there was a recognized shortage of materials. Each child had only one exercise book for all subjects and there was virtually no additional paper available. There was an adequate supply of pencils and chalk. I saw several upper grade children with rulers, however, there were no scissors or glue in the

school. While I was there the school obtained some plasticine and paint at the supplies centre which they did not have before. There were about forty individual chalkboards in the school, which were being used by the children as desks in the lower grade classrooms. The headmaster commented that supplies were not readily available and the delivery of expected materials was frequently delayed.

Equipment

There was an acute shortage of desks at the school. Three classrooms had no desks at all. In almost every classroom some children had to sit three to a seat. The desks in general were in poor condition. It was not uncommon for desks to just fall apart of their own accord, as happened on three different occasions during one lesson.

There was very little additional equipment at the school. There was a duplicator machine which was supplied by the government several years ago. At the time I was there, it was not working and there was no attempt being made to repair it since the problem was not minor and the teachers were unable to fix it themselves. Though the government had supplied the machine, the school was responsible for repairing it. The staff indicated that it was beyond the means of the school to keep it in working order.

The school owned two radios; one purchased by the Board of Management and the other was acquired by the school from the Department of Education. Each of the male teachers had a radio of his own, though not all were working. These radios were shared by all the teachers and were used very regularly by all grade levels to listen to the appropriate broadcast programs.

I was told that the school did not have any sports equipment during the previous year nor up to the time of my stay. Soon after my arrival (with no apparent connection to IMP) the school was issued with a soccer ball, a volley ball and twenty tennis balls by the Department of Education. The equipment was used every day, weather permitting. The teachers improvised the equipment they lacked, such as using bits of lumber as baseball bats and making hoops out of bush material for basketball.

School Officials

The Board of Management was the governing body of the school. Its main duties included establishing school policies and overseeing their implementation. It also looked after the school's finances. Some teachers expressed concern about the Board not meeting its own responsibilities and interfering with the teachers' responsibilities though their allegations were not specific.

The Board of Management was made up of the following members:

- Senior teacher
- Headmaster
- One representative of each of the five Council wards:

  Mr. Nande (Vakela), the Chairman from Kongibulg Village

  Mr. Kunuma (Kayonu), from Kisenpol (Wagume) Village

  Mr. Kanopu (Oke), from Pokarapug Village

  Mr. Kapala (Gini), from Maral Village

  Mr. Tikipie (Yole), from Kero Village. (He was also the doctor orderly at the aidpost. His tribe was from the Yambie area, but now was considered to be part of Kero.

- There was also supposed to be one village councillor on the board, but none attended.

Kero Community School - Teaching Staff

The following table lists the years of experience for each teacher and selected characteristics of each class.

KERO TEACHING STAFF

Grade Level	Teacher	Years Exper.	No. of Boys	No. of Girls	Total	Mean Age (X)
1A	Mr. Kolant	3	19	19	38	7
1B	Mrs. Kepas	1	32	8	40	7
2A	Mr. Kepas	3	18	17	35	8.3
2B	Mrs. Wangi	4	16	18	34	9.2
3	Mr. Pisimi	15	19	22	41	9.8
4	Mr. Wangi	4	15	17	32	10.2
5	Mr. Rumi	5	13	19	32	12.8
6	Mr. Piason	2	20	13	33	14.4
	TOTAL	$\bar{x}$=4.6	152 (53%)	133 (47%)	285	$\bar{x}$=9.7 T

Daily Time Schedule

At 7:00 am the school garamut was beaten by one of the teachers to call the children to school (though not all children lived close enough to the school to be able to hear it). The children arrived any time between 7:00 and 8:00 am. The school day began at 8:00 am, which was signalled by a final beating of the garamut. The same signal marked the beginning and end of each recess as well. On Monday, Wednesday and Friday there was an outdoor assembly beginning at 8:00 o'clock and lasting for about fifteen minutes. Following this the children immediately went to their classes and instruction began. A morning recess break was scheduled each day between 10:00 and 10:30 am. Instruction resumed until 12:00 o'clock when the children and teachers had an hour break for lunch. Class time followed from 1:00 to 3:15 pm and occasionally continued longer if a teacher found it necessary to complete a lesson. On Thursdays from 1:00 to 2:00 pm religious instruction was held by representatives from the different churches. On Fridays from 1:00 pm until the end of the day, all of the students were involved in various maintenance projects around the school, such as working in the garden and building fences.

SCHEDULED MINUTES OF INSTRUCTION PER WEEK
KERO COMMUNITY SCHOOL

Grade Level	Maths	English	Science	Community Life	Art	PE	Other	Total
1	210	480	30	150	180	100	425	1575
2	210	585	30	150	180	100	395	1650
3	210	610	40	210	180	100	300	1650
4	210	580	40	240	210	150	220	1650
5	210	550	60	720	210	150	200	1650
6	210	550	60	720	210	150	200	1650

Community Setting

There were approximately fifteen villages serviced by Kero School. The distance from these villages to the school varied from three minutes to over two hours walking time. Most children took forty-five minutes to one hour to walk one way to school. There were no population records available for each village at the time of this survey, but the results of the National Census, carried out during the time of my stay, should be available in 1981.

Livelihood: Most parents were subsistence farmers and spent a good part of the day working in the kaukau gardens. It was very common to see men walking around making unique Ialibu baskets which were sold in the tourist market. People lived in rectangular and round houses made of bush materials with kuni grass roofs and pitpit-matting walls. The many streams were used for drinking water, washing clothes, bathing and fishing.

Political Structure: The government council and village court system had a definite influence on the peoples' life at the local level. Apart from the governmental imposed legal and political systems a traditional political structure operated within the community as well.

People lived in villages composed of a single clan group. Villages varied in size from less than one hundred to a few hundred people. Within each village there were head men who provided leadership in the village. These men generally were the most wealthy, having the most wives and the most land. They also showed an expertise in giving public

speeches and were very knowledgeable about traditional magic and "poisoning". Each village also had a chief, generally an inherited position. Any disputes among people of a village would first be brought to the chief to settle. He was considered to be a very wise man as well as one who had powers of prediction.

Religion: I was told that traditional religion was no longer practised and that almost all people considered themselves to be christians. There were four different christian sects actively represented in the area - Catholic, Lutheran, Bible Mission and Seventh Day Adventists.

Westernization: Westernization is very much a factor of development in this area. The two institutions, the christian church and western schools, are very prominent and have been readily accepted. In addition, various artifacts from western culture were increasingly seen, for example, in the local trade stores, where western foodstuffs and commodities were sold for currency, and in the everyday attire of the people. Men were commonly seen wearing an old coat or shirt over their bark belt and leaves, carrying a metal blade bush knife and an umbrella. Women usually wore some sort of cloth draped over them and usually over some sort of tattered dress. But though the artifacts of western culture were quite visible, the general life style was still traditional subsistance farming.

School Attendance: I was informed by the headmaster that approximately ninety percent of the school age children, who live in villages within an hours walking distance, attended school. In those villages that were further away, the figure was much lower.

Distance from the school was not the only consideration of parents when deciding whether or not to send their children to school. In past years there was a problem of parents not sending their female children to school. People believed that those girls who went off to school would marry on their own accord instead of through a family arranged marriage, thereby causing the family to lose the bride price. This concern seems to be diminishing somewhat since almost half the student population is now female. There is a tendency, however, for girls to drop out of

school in the upper grades to work in the gardens or help with young children at home.

One major reason that parents would decide not to send a child of either sex to school was that they had reason to believe that their child would not do well in community school and therefore would not go on to high school. They based this decision on the school record of their other children or other children in their village. Parents felt that if these other children did not go on to high school that their child was not likely to do so either. If their child was not likely to go on to high school it was not deemed worthwhile for them to spend the money to send him/her to community school or spend their own time working for the school.

Summary of Language

Imbonggu was the language spoken in the Ialibu area. Children entered school fluent in their own language, with some knowing a little Pidgin. I was told by a first grade teacher that those children who came to school knowing some Pidgin would generally pick up English more quickly and therefore tend to progress academically more quickly. Children entered school not knowing any English, or at best they knew the number names and letters of the alphabet learned from older siblings.

The younger children spoke to one another predominantly in Imbonggu, both on the playground and in the classroom. The only English that was heard were numbers and some one-word phrases. In the upper grades more English was spoken between the children in the classroom.

The teachers in the upper grades spoke mostly to the children in English, especially when giving lessons, but it was not uncommon to hear them use Pidgin or Imbonggu when giving directives and maintaining discipline. In the lower grades the teachers seemed to use more Pidgin or Imbonggu in instruction when the children were confused by the English explanations. (Two teachers were native Imbonggu speakers and other teachers had learned to speak some of the local vernacular during their years teaching at Kero School.)

The Headmaster predicted that seventy percent of the community people knew some Pidgin, though this figure seemed high to me. Also he thought that the same percentage of women knew Pidgin as men, but from my own experience I found that more men than women could speak Pidgin.

Traditional Education in the Community

The Headmaster, a product of the local community, indicated that no formal education existed within the traditional culture. Neither was there a standard technique of teaching children. The particular technique used would depend on the situation and the disposition of the parents at the time. At times parents would give verbal instructions though at other times children would be expected to learn through observation and imitation. I was told that there were no longer traditional initiation ceremonies for either girls or boys. There was no specific training in traditional customs though there were certain values that parents required children to abide by such as the abolition of dirty language and the discretion of girls around young men. Parents generally did not beat their children but would if the child's action was objectionable enough. As punishment parents would typically withhold food or make the children work before they were fed.

Family Structure

Each married woman had her own house where she lived with her children. It was prestigious and a sign of wealth for a man to have more than one wife, though many men seemed to have only one. Men could visit their wives at their houses, but slept in a mens' house with the other men in a village. Women typically have up to five children. Ideally children were spaced six to seven years apart for reasons pertaining to beliefs both about the relationship of sexual intercourse to fertility and ideas about women not wanting to have more than one child to care for at a time. The practice of spacing children may have been more prevalent in the past when tribal warfare was common and women did not want to have more than one small child to carry when fleeing from enemies.

Community Life and School Performance

It was believed by teachers and community people that the way a child

behaved in the community was predictive of how the child would perform in school. The child who was obedient and hard working at home was going to be hard working at school, and therefore successful. It was also believed that those children with hard working parents would also work hard in school. Students coming from homes where they were neglected by their parents were thought to do worse in school.

IMPLEMENTATION STUDY

Teacher History

Thomas Rumi's life's story is an interesting one. He attended several different schools and trained for several jobs before becoming a teacher. It is interesting to note that Thomas was from a village in the Yombie area of the Southern Highlands Province which was a traditional enemy of Kero, Kongibolg, and Moral, three villages serviced by Kero School.

His first school experience was in 1960, in a Seventh Day Adventist village pre-school. The next year he left to attend an SDA school in the Mt. Hagen area completing grade 4 in 1964. The following year he left school because he was severely punished for eating pig meat at a special family celebration feast. He returned to his village for the remainder of that year and attempted grade 5 the following year at a Lutheran school in the Mt. Hagen area. He was unable to complete the year since the family he was living with treated him unfairly.

Later that same year he enrolled in Mt. Hagen Vocational School to learn carpentry and mechanical repairs. At the end of the year he scored highest on the year's end test but was discouraged from going into the trades because of his small stature and instead advised to go on to primary school. After doing odd jobs for a year he was placed in grade 6 at the Lutheran school he had previously attended. He went on to complete grades 7 to 10 at Pausa High School, a Lutheran school in Enga Province.

Following high school he applied to Goroka Teachers College but was not accepted. However, he was accepted into a program to train as a correctional officer at the Bomana Corrective Services Training Centre in

Port Moresby. During that year a letter from a Catholic Priest who had supported him during high school influenced him to quit the correctional officer training program and apply again to teacher's college. At the end of 1973 he went to work for Burns Philp until he heard that he had been accepted at Lae Teacher's College.

He attended Lae Teachers College during 1974-75. In 1976 he started teaching in a Lutheran agency school in the district of Wabag, Enga Province. At Irelya School he taught grade 6 during the first half of the year and grade 1 during the second half. In 1977 he transfered to Wapanamanda district in Enga Province where he taught grade 6 that year and the next. In 1979 he transfered to Kero school to be closer to his parents. He taught grade 4 in 1979 and was teaching grade 5 in 1980.

Thomas has attempted to be involved in the community in order to win the parents trust. In 1979 he, along with some of the other teachers, contributed a large sum of money to the feast of a community man who had died. In 1980 he had started doing a survey of the number of children in each village, in the infant to seven years range and the seven to twelve years range. This information will be important to both the school and the community in order to effectively plan for the upgrading of the school.

Curriculum Implementation Study

The following table lists the number of students in each class involved in the study at Kero Community School.

EXPERIMENTAL AND CONTROL CLASSES
KERO COMMUNITY SCHOOL

Grade Level	Boys	Girls	Total	Mean Age
2A (control)	n=18	n=17	n= 35	$\bar{x}$= 8.3
2B	16	18	34	9.2
4	15	17	32	10.2
6	20	13	33	14.4
TOTAL	69	65	134	$\bar{x}$=10.5 T

The number of children in each class was roughly equivalent. It is interesting to note that there was almost a years difference in the mean age of the grade 2A and 2B children. I was unable to ascertain the reason for this difference. My own observations agreed with this finding as the grade 2B children seemed more mature and physically larger.

The following table lists the number of subjects assessed for each achievement measure and the cognitive tasks.

SUBJECTS ASSESSED
KERO COMMUNITY SCHOOL

Grade Level	PMAT 2	TAS I	COG 4	PMAT 3	TAS 2
2A (control)	n= 36	n= 37	N/A	n= 36	n= 36
2B	34	34	n=15	34	33
4	32	31	15	32	32
6	33	31	16	33	33
TOTAL	135	133	46	135	134

All children were given the PMAT and arithmetic tests before and after the trialling period. There were enough children in all classes to do the planned fifteen cognitive interviews, five each from the high, medium and low PMAT score strata.

Documenting Curriculum Implementation

There were no major difficulties in documenting curriculum implementation, as specified in the Field Guide for Documenting Classroom Events and the Community Environment (Levin et al, 1980). It is important to keep in mind that field notes alone could not accurately document all the interactions and behaviours of complex classroom events. Toward the end of the trialling period, I found that it was best to attempt to do the final form of the notes in real time with later minor revisions. Compiling rough notes and later completely rewriting them in a final form proved to be overly time consuming especially in light of the heavy observation and interview schedule.

Teacher's Comments and Questions: In general the teacher did not express many questions or comments about the lessons during the preliminary interviews. Usually his only reaction was to comment that the lesson seemed straightforward. This is not to say that those lessons proceeded without problems. There were lessons which he indicated he understood during the preliminary interview, but became confused or unsure about while he was teaching. He occasionally made comments having to do with aspects of the activity which he felt would be confusing to the children. He would then discuss ways he felt he could make the lesson clear to the children. Another general category of comments were related to the availability of materials. He sometimes asked for clarification regarding which IMP materials he would be using and their use in specific steps of a lesson.

A general problem encountered with the lessons involved organizational matters. He had difficulty organizing various aspects of the lesson efficiently, often taking ten minutes or more to pass out the materials. After several lessons I suggested he introduce the lesson while he and selected helpers distributed the materials.

This involved Thomas immediately choosing a few children to pass out chalk and erasers to the other children. Meanwhile he would introduce the lesson by perhaps drawing on the chalkboard whatever diagram the children were then to copy on their desk tops. As the children were drawing the diagram on their desk tops, Thomas could distribute any manipulatives the children would need. After a few children finished the diagram they could help him. The main idea was to get the children involved in passing out the materials so that Thomas would not have to do it all on his own. This technique was quite successful in getting the class organized quickly and progressing on lesson objectives.

Other problems related to confusion associated with the details of the procedures or the steps of a lesson. At times he had a hard time remembering the order of the steps and keeping on task. Occasionally he confused two different lessons. This was particularly true in grade 2 lessons (53A and B). For the most part he seemed to understand the concepts but became confused by the details of the procedures. In some lessons he could not figure out answers to some of the problems and

questions (for example 6-29). Also the grade 4 division lessons did not provide sufficient explanation or examples to enable the teacher to fully understand the activity and procedures to follow. These problems all indicate the need for carefully planned in-service training using the actual materials and techniques required for classroom implementation. The Teachers' Notes are a useful resource but alone are insufficient to provide the necessary technical knowledge to effectively support instruction.

Evaluation of Instruction Materials

Most difficulties arose with the grade 2 curriculum. In some lessons the concept addressed was difficult for the children. In most cases, however, the problems were at the procedural level. In many lessons the activity involved too many steps making the task overly complicated. Specific strengths and weaknesses for each grade level will be discussed below.

Grade 2

Classification: The Kina Cards proved to be appropriate materials for use by grade 2 children with classification tasks. Language seemed to be the main problem in teaching classification. The use of English phrases such as "same", "go together", and "difference" was confusing to some of the children. Using these terms without a thorough preliminary explanation was inappropriate for children who were far from fluent in English.

Besides the assumption that the vocabulary was understood by the children, the activities should be introduced more slowly. There should have been more lessons introducing the different attributes of each card before working on attribute grouping problems. The children would have also benefitted from several more lessons on simple grouping. The children also had difficulty drawing the kina cards and diagrams. The drawing requirements were much too demanding. The children spent most of their time copying the worksheets, leaving little time to do the activity itself.

Measurement: The measurement lessons concerning length and size comparisons using local materials were very appropriate for grade 2. The lessons which involved copying pictures from the workbooks, cutting and

pasting lacked effectiveness since these aspects of the activity were far too time consuming, and materials such as scissors and paste were not readily available. Perhaps consumable worksheets would be more appropriate for some of these lessons.

Number Operations: The computation and place-value lessons were generally very suitable, though challenging. The actual steps involved in doing an activity were often too complex and involved too many steps for the teacher and the children to coordinate effectively. This was especially true of the lessons where children were using various materials in conjunction with chalkboards and exercise books. These lessons need to be simplified in terms of the number of procedures and elements the children are required to coordinate.

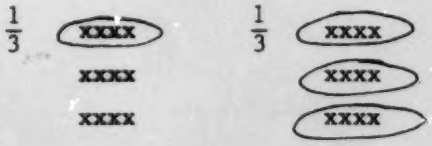
Grade 4

Classification: These lessons overall were very effective. The children had some difficulty drawing the diagrams, especially when they were asked to copy the figure onto a smaller area. They were most successful drawing the Kina Cards and "road systems" when they worked in a group situation drawing on a chalkboard. In order to simplify the task in the first lesson the teacher could prepare the diagrams on the board ahead of time so the students could focus on the task itself rather than the preparation for the task. These lessons might also be improved if the teacher demonstrated more examples before the children proceeded with the activities on their own. Again the problem of language arrose with the concepts of "and" and "or" (conjunction and distinction). They were not emphasized by the teacher, since the presentation of these was very vague in the Teachers' Notes. These concepts need to be more fully explained in the Teachers' Notes and additional activities should be included perhaps developing functional equivalents for each concept in Pidgin or vernacular.

Logical Relations: No grade 4 measurement lessons were planned for term three. Instead lessons involving logical relations were included. Though the activities were motivating and most were suitable for this level, the objective of some of the task remained unclear to the students and sometimes the teacher. This was especially true with the clock games.

The lessons could be substantially improved if the teacher demonstrated several examples of the task with the whole class to clearly demonstrate the procedures before breaking into groups. Lesson 146D was more successful than prior lessons since the teacher introduced it more thoroughly and slowly than is indicated by the Teachers' Notes. He started by changing only one attribute at a time then worked up to two. This method of introduction could be incorporated into other lessons in order to improve them. Finally the answers to all of the exercises in lessons 146C and 146D should be added to the Teachers' Notes in order to clarify any uncertainties the teacher might have.

Number Operations: These lessons were very appropriate for grade 4 in terms of content though the concepts did not seem new to the children. The lessons on fractions were more challenging than those involving whole numbers. This may be partially due to the fact that the objective was not made sufficiently clear. More time should be spent on developing the idea of dividing objects and sets into equal parts. Also to avoid confusion the presentation of problems on the worksheets should be as consistant as possible regarding the type of examples and shading. For example on one page only one third of a set was circled and on another all three thirds would be circled.



With whole number operation lessons more detailed directions should be included along with a graphic example of the required procedures using base-10 materials. The initial lessons on multiplication should provide more activities in which children can practice their multiplication facts. We found that the lessons on multiplication facts (149D and 149E) required too much preparation on the part of the children, though the activities themsleves were very worthwhile. The procedure of cutting out and pasting the squares on the flash cards was too time consuming, such that the children were not able to spend adequate time practicing the multiplication facts.

Grade 6

Number Operations: Though the early lessons on counting systems were interesting to the children and teacher, they were not familiar enough with their indigenous counting system in order to adequately answer all of the questions. These lessons would be more appropriate if they were to encourage the children (and teacher) to talk with village elders in order to learn the traditional system. The origins of the systems described in the lesson should be given as well.

The table on page 10 in the student book was confusing to the teacher and children since it seemed to be assigning zero a cardinal value of 1. The squares should be renumbered 1 to 100 instead of 0 to 99 to record the number of squares.

In activity 6-7 too much time was spent by the children preparing the place-value cards leaving little time to actually do the activity. Perhaps these materials should be supplied as learning aides. The multiplication table in activity 6-29 was extremely confusing to both the teacher and the children. This summary activity would be greatly improved if the directions were more thorough and included more examples.

In general the concepts and activities seemed appropriate for this grade level, though the early lessons were not particularly challenging. Using the base-10 materials and squared paper was generally successful, though there is a need for the teacher to work through more examples with the whole class before the students can be expected to go on and do the activities on their own.

A final suggestion again would be that the answers to all the problems and thought questions be included in the "Teachers Notes" in order to help clear up any confusions the teacher might have with a lesson.

Evaluation of Teachers' Notes

The Teachers' Notes were used extensively during the preparation for each lesson and refered to often during implementation. They generally presented the procedures in a very clear, and straightforward manner. In the introductory lessons, especially in grade 4, the directions and worked examples were noticeably brief. The teacher was often confused during this

important introductory phase of a new topic and had a hard time using the Teachers' Notes successfully. There should be more detailed explanation of procedures and worked examples given in these lessons. Also, as mentioned earlier, the answers to all problems should be included.

In order to make the Teachers' Notes more complete a brief introduction should be included giving an overview of the concepts and discussion of the general organization and structure of the lessons. There should also be a unit summary at the beginning of each new topic to discuss content and objectives of the lessons. A description of each lesson objective as well as ideas for motivating or introducing the lesson could be added to the beginning of each lesson.

Evaluation of Learning Aids

Base-10 Materials: These materials were generally used very successfully at each grade level by both the teacher and the children. The teacher was very enthusiastic about using them and found them to be very useful in presenting the concepts to the children. The children readily understood how to use the materials and seemed to enjoy using them.

Kina Cards: These materials worked very well for teaching classification. Both the teacher and children seemed to enjoy using them. The grade four children became familiar with them quickly and were more successful at using them than in grade two. However this may have been related more to the actual activities than the materials themselves.

Coin Cards: These cards were also very effective in presenting the concepts of place-value and exchange. The practical aspect of using the coins seemed to be a very good experience in itself. The only problem involved the paint on the kina coins which the children enjoyed rubbing on themselves resulting in several silver faces.

Measurement Devices: During my stay the metre sticks were used minimally and only by the teachers. I encouraged the grade 6 students to use the trundle wheels to make measurements of the school. They seemed to be able to use them quite well with little instruction. The balance scales were not used while I was there.

Other: The learning aids that the children made themselves tended to involve more work for the children than they were worth (number blocks, flash cards, place-value cards). The majority of the time was spent in

making the learning aids rather than in actually using them. The aids seemed to offer a motivating aid to learning so perhaps they should be produced prior to use in the lesson.

LESSONS IMPLEMENTED - KERO COMMUNITY SCHOOL

Grade Level	Lesson Codes	Detailed Notes	Total Lessons
2	53A, 53B, 53C, 53F, 53G, 53H, 53-1, 53-2, 55A, 56A, 57A, 57E, 57G, 57E-1 & 2, 58A, 58B, 58G, 59D, 60A.	19	31
4	144A, 144C, 144D, 145A, 146A, 149A, 149F-1 & 2, 149G-1, 149G-2, 164A-1 & 2, 164B-1 & 2.	11	23
6	6-1, 6-5, 6-12, 6-13 & 14, 6-16, 6-17 & 18, 6-22 & 23, 6-24, 6-25, 6-31, 6-35.	10	28

(Note: 57E-1 & 2, 149F-1 & 2, 164A-1 & 2, 164B-1 & 2, 6-13 & 14, 6-17 & 18 and 6-22 & 23 taught as one lesson.)

Documenting Language-Use

I found documentation of language-use on the forms provided the easiest form of field notes to take. The procedure I used was to record, on site, all talk and actions in the narrative, and any unusual speaker, addressee information in that column. Then later I would go back and fill in the rest. There should have been more codes for "Lesson Phase" because there was not an accurate way to code those times when the teacher stopped the lesson to give further instructions. Also it was usually hard to accurately code "Interactional Function" when the teacher switched to Imbongu.

LANGUAGE-USE LESSONS - KERO COMMUNITY SCHOOL

Grade Level	Lesson Codes	Total
2	53C, 55B, 56B, 57F, 57H.	5
4	144B, 145B, 146C, 149C.	4
6	6-2, 6-6, 6-15, 6-19, 6-27, 6-29.	6

Summary of Language-Use

Thomas almost never used Imbonggu or Pidgin unless it was indicated as part of the lesson in grades 4 or 6. On rare occasions he would switch unintentionally and say a word or two in Pidgin. Imbonggu was never used in instructions. When the children were speaking to one another they would often speak vernacular and sometimes Pidgin or English.

Grade two though was an entirely different situation. The children were often confused after instructions were given in English. The teacher would then switch to Imbonggu or Pidgin to repeat the instructions or give further explanation. He would sometimes ask questions in Pidgin during the whole class instruction period. When giving individual or small group help he would readily switch to Pidgin or Imbonggu if the children seemed confused with English. The grade two children always talked in Imbonggu among themselves during the lesson time. Essentially the only English words heard were numbers.

Documentation of Classroom Interaction

Field notes addressing classroom interaction variables seemed the most difficult and time consuming to do. It was hard to keep up with recording the talk and type of interaction at the same time. Usually I was only able to fill in the talk on site and later had to go back and fill in "Addressee-Speaker" column and code the interaction. I also had to go back through the tape following the lesson to note the counter numbers associated with specific speech acts and add any speach acts which were missed. I found the process very time consuming.

CLASSROOM INTERACTION LESSONS - KERO COMMUNITY SCHOOL

Grade Level	Lesson Codes	Total
2	53D, 55C, 56C.	3
4	144E, 145C, 146D, 149E.	4
6	6-3, 6-7, 6-9, 6-21, 6-28, 6-32 & 33.	6

Summary of Classroom Interaction

The classroom interaction codes we developed were only able to describe a limited number of different classroom interaction patterns -- only those related to certain teacher initiation/children response/ teacher evaluation sequences. There were many other aspects of classroom interaction that our codes could not capture. In actuality the coding on the "Language-Use Forms" probably gave a more accurate general description of classroom interaction and events during the lesson.

In any whole class presentation the same pattern of interaction generally occurred in each lesson and at each grade level. The teacher would initiate a constrained question and the whole class would chorus a response. There were some cases where an individual child would be called on to respond. It is interesting to note that the teacher did little evaluation, especially elaborate praise evaluations.

Student Interviews

Initially the student interviews were conducted without recording them. These interviews had to be kept very simple in order to take notes on the interviewers questions and the children's responses. I decided that these interviews would be more informative if the discussions were more clinical in nature. This required tape recording the interview so vital information would not be lost. I found it too time consuming to go back and transcribe these tapes even though the interviews were very interesting. I resumed my initial structured interview format without recording. I think it would have been worthwhile to conduct an extensive clinical type interview taking only minimal notes and relying on transcription at a later time.

Conducting the interviews with the grade 2 children was very difficult due to the language factor. Most grade 2 children were not proficient enough in English nor was I proficient enough in Pidgin to carry out any involved verbal interactions. Essentially these interviews were limited to the interviewer directing the child to carry out a task and the child attempting to do so. There was little point to ask any "why" questions since often the children would either not understand what they

were being asked, or if they did, it was unlikely that they could formulate a response I could understand. Interviews with older children were somewhat more productive though still convergent and structured in format.

STUDENT INTERVIEWS LESSONS - KERO COMMUNITY SCHOOL

Grade Level	Lesson Codes	Total
2	53E, 55D, 56D, 57D.	4
4	144F, 145D, 146B, 149D.	4
6	6-4, 6-8, 6-10, 6-20, 6-26, 6-30.	6

Summary and Conclusions

The teacher generally had an enthusiastic and positive attitude about the lessons and materials. He also attempted to follow the lesson as prescribed unless he anticipated problems behorehand, in which case an alternative approach was planned.

In regards to the IMP in-service course prior in the trialling implementation, I didn't observe the teacher refering to any in-service notes and there were only a few instances when he made mention of an activity presented at the in-service.

I am under the impression that a successful in-service could be accomplished in a two week period, perhaps less if the time between the in-service and implementation was kept to a minimum. Any in-service should occur fairly close to the time of implementation, so that the teacher would be able to easily recall what had just been learned and be able to use it immediately with his class. Perhaps if the IMP in-service had been closer to the trialling implementation time the teacher would have more readily referred to any notes from the in-service. Also it would be helpful to the teachers to have the "Teachers' Notes" and student workbooks available during the in-service.

Kero School impressed me as generally a well-run school where a substantial amount of learning was going on. The teachers were confident

in their abilities as teachers and they also seemed committed to the success of their students in order to help the community. There were many basic supplies that the school lacked but despite these deficiencies the teachers were able to make innovative substitutions.

The community seemed to be generally committed to the school and interested in their childrens' education. In a discussion with the parents I was told they felt that western schooling was important at this point in their community development. Their major concern was that their grade six children would go on to high school. They realized that without a high school education there was little chance of their children getting a good job. Most of the parents showed concern about at least some of their children getting a job in the money economy in order to bring in money to the family and community.

Looking through the school history book I found that the school has had several very enthusiastic and hard working teachers who have implemented special projects such as a "radio room", adult classes and a school canteen. This sort of enthusiastic attitude seemed to be lacking to some extent in the present teachers, though perhaps their enthusiasm was merely directed in other areas. There was a real effort while I was there to increase enrollment in order to upgrade the school to a level five. They were planning to have three grade 1 classes in 1981. Also there seemed to be a substantial amount of effort directed towards the up-keep and improvement of the school grounds. During the time I was there however the school engaged in no serious money making efforts though they were planning a sing-sing for the near future.

I believe that Kero School is likely to be successful as long as it continues to have dedicated teachers and a supportive community. The school could lose parental support unless a viable alternative is found for grade six children who are unable to go on to high school.

Evaluation of Curriculum Materials

The curriculum materials proved to be appropriate and generally successful. The problems that did arise acted to point out the weaknesses that if corrected should result in an even more successful curriculum.

Generally there is a need to simplify procedures and include more thorough explanations and worked examples. Overall this trialling implementation made clear that these new materials have great potential and can under the right conditions be implemented into the schools.

Summary of Language-Usage, Classroom Interaction and Student Evaluation of Learning

The field-notes addressed three factors that influence learning:

1. The contectual determinants of language usage during instruction.
2. The interaction between the students and the teacher.
3. The individual child's interpretation of lesson objectives and his success in attaining them.

As discussed earlier language was less of an issue with the two upper grades than it was with grade 2. It was apparent that the grade 2 children had a hard time understanding many of the mathematics concepts when presented in English. These children needed and frequently received further explanation in their native language or in Pidgin.

The field-notes on classroom interaction indicated a consistent pattern of interaction when the teacher was working with the whole class, namely a teacher initiated question followed by a whole-class chorused response. However the teacher did not restrict himself to this one teaching style. He frequently followed the suggestions in the "Teachers' Notes" and had the children work on some activities in small groups or individually.

Adequately evaluating the individual child's perception of their own learning was more difficult. I was not very successful at figuring out exactly what to ask or how detailed to make the interview. The grade two children were especially difficult to interview because of mutual language difficulties.

Conclusion

My experience at Kero School showed me how effective teachers can be even with little equipment and support. This is not to say that there

isn't a genuine need for improved supplies and curriculum materials. Student text books and additional learning aids are very much needed but they can not be simply issued to the schools like soccer balls and still be expected to be implemented effectively or even used at all. An effective in-service program must be planned for teachers prior to implementation. Inspectors could be specifically trained to lead 3 to 5 day workshops on a school or regional basis. The course should be designed around the actual classroom materials and should include practice teaching with children or at least with workshop participants acting as a class. A follow-up session should be planned several weeks later to discuss common problems and concerns. Regardless of how carefully the new curriculum is developed it will all be in vain unless teachers can be trained to implement it effectively.

INDIGENOUS MATHEMATICS PROJECT

WORKING PAPER SERIES

1. Learning to Compute.
   R. Souviney, January 1980.

2. Strategies for Mathematical Problem Solving.
   R. Souviney, March 1980.

3. Assessment Administration Guide.
   R. Souviney, April 1980.

4. Field Guide for Documenting Classroom Events and Community Environment.
   P. Levin, M. Gearhart and R. Souviney, June 1980.

5. International Congress on Mathematics Education.
   R. Souviney, V. Kada and D. Malaga; D. Lancy; M. Britt; B. Roberts, August 1980.

6. Andra Community School Field Report.
   P. Levin, November 1980.

7. Ororo Community School Field Report.
   J. Lineberger, November 1980.

8. Divanap Community School Field Report.
   M. Gearhart, November 1980.

9. Kero Community School Field Report.
   K. Johnson, November 1980.

10. Muglamp Community School Field Report.
    B. Rowe, November 1980.

11. Teachers Notes and Student Worksheets – Grade 2. 1980.

12. Teachers Notes and Student Worksheets – Grade 4. 1980.

13. Teachers and Students Text – Grade 6. 1980.

14. The Changing Form of Numerical Reasoning Among the Oksapmin.
    G. Saxe, January 1981.